**DIFFERENTIATED INSTRUCTION DETAILS**

**Knowledge of Students**
- Differentiation based on student:
  - Readiness
  - Interests
  - Preferences:
  - Styles
  - Intelligences
  - Preferred method of solving equations

**Need to Know**
- Each student's level of readiness for solving equations

**How to Find Out**
- Examine previous work with solving equations algebraically to determine if students can use inverse operations appropriately in multi-step problems, e.g.:
  1. Do they need teacher guidance to solve a problem?
  2. Are they able to solve most equations independently but need more practice? Or,
  3. Are they able to solve any equation accurately?
- Use a pre-assessment problem solving task; see the Minds On segment of the lesson inside this folder

**Differentiated Instruction Response**
- Learning materials (content)
- Ways of learning (process)
- Ways of demonstrating learning (product)
- Learning environment

**CURRICULUM CONNECTIONS**

**Overall Expectation: Number Sense and Algebra**
- Simplify numerical and polynomial expressions in one variable, and solve simple first-degree equations

**Specific Expectation:**
- Solve first-degree equations with non-fractional coefficients, using a variety of tools

**Learning Goals:**
- Solve linear equations
- Make connections between graphical and algebraic models

**ASSESSMENT AND EVALUATION**

**Assessment/Success Criteria**
- Thinking
  - Reasoning and Proving*: Explains a solution to a linear equation and justifies the solution
- Communication
  - Communicating*: Uses appropriate mathematical conventions when solving mathematical equations
  - Representing*: Describes the effectiveness of solutions using various representations

**Assessment Tools:**
- Checklists
- Anecdotal Comments

**PRIOR LEARNING**

Prior to this lesson, students will have:
- Translated statements of mathematical relationship into equations
- Solved and verified linear equations with one variable term using a variety of strategies

**MATERIALS AND RESOURCES**

**Materials:**
- Four signs labeled "Algebraically," "Graphically," "Guess and Check," and "Another Method" for the Corners activity
- Chart paper and markers for Minds On activity
- Variety of math tools for Minds On activity (e.g., graphing calculators, algebra tiles, linking cubes, graph paper)
- Highlighters for Tiered Assignment A, Activity 1
- Appendix A: Class Assessment Checklist—one for teacher reference
- Appendix B: Self-Assessment—Solving Linear Equations—one per student
- Appendix C1 (pp. 1 & 2): Tier 1: Assignment A (Activities 1, 2 and 3, Activity 1—Guided Discussion Script)—one per student completing Assignment A
- Appendix C2: Tier 2: Assignment B (Activities 1, 2 and 3)—one per student completing Assignment B
- Appendix C3 (pp. 1 & 2): Tier 3: Assignment C (Activities 1, 2 and 3)—one per student completing Assignment C
- Appendix D: Peer Assessment—Solving Linear Equations—one per student
- Appendix E: Linear Equations Puzzle—cut and bagged, one set per group of three or four students

**Internet Resource:**
- TIPS4RM (Targeted Implementation and Planning Supports for Revised Mathematics)—Grade 9 Applied:
  - www.edu.gov.on.ca/eng/studentsuccess/mon/tips4rm.html#grade9ap

**Resource:**
Differentiated Instruction Teaching and Learning Examples 2009

Teaching/Learning Sequence: Grade 9 Mathematics, Applied (MFM1P)—Solving Linear Equations

**MINDS ON**
- Establishing a positive learning environment
- Connecting to prior learning and/or experiences
- Setting the context for learning

**CONNECTIONS**
- U: Literacy
- ML: Mathematical Literacy
- AFL: AfL: Assessment for Learning

Individuals → Pre-Assessment Task

Present the following problem to the class and ask them to solve it individually using any method they choose (e.g., algebraically, graphically, guess and check). Have manipulatives available for the students to use.

Nasir just purchased a custom T-shirt from T-riffic Prints with his favourite saying written on the front. T-riffic Prints charges $9 for the T-shirt and $0.80 for each letter written on it. If Nasir's custom shirt totaled $30.60 before taxes, how many letters are in his favourite saying?

Circulate while students individually solve the problem to observe students’ readiness to solve linear equations.

Observe to determine which students:
1. Need teacher guidance to solve the problem
2. Can solve this equation independently but would benefit from more practice
3. Can solve this equation accurately and with ease

Use Class Assessment Checklist (Appendix A).

Create student groupings for the Tiered Assignment based on student readiness.

**Small Groups → Corners, Think-Pair-Share**

Students:
- Take their solutions to the corner that best represents the method they used to solve the problem
- Review their solution for correctness and form with another student who used the same method
- Note any variations that were used within their chosen method and share with their corner group
- As a corner group, write one complete solution on chart paper, present their solution to the class and describe why this corner was their first choice for solving this particular problem

Observe students’ responses using the Class Assessment Checklist (Appendix A) during the Corners activity.

**Individuals → Pre-Assessment (Self)**

Students self-assess their current understanding of equation solving by completing the “before” column of the Self-Assessment—Solving Linear Equations Checklist (Appendix B).

**ACTION**
- Introducing new learning or extending/reinforcing prior learning
- Providing opportunities for practice and application of learning (guided → independent)

**Pairs/Small Groups → Tiered Assignments**

Students work in groups to complete three tasks solving equations algebraically.

Tier assignments are differentiated based on student readiness as described below:

**Tier 1—Assignment A** (see details, Appendix C1, pp. 1 and 2) is for students who still need support to solve equations algebraically. In this highly structured Tiered Assignment, students work through examples that progress from those that provide detailed scaffolding to those that require independent practice.

**Tier 2—Assignment B** (see details, Appendix C2) is for students who are somewhat comfortable with solving equations algebraically. In this Tier, the assignment is less structured so that students can deepen their understanding.

**Tier 3—Assignment C** (see details, Appendix C3, pp. 1 and 2) is for students who are skilled at solving equations algebraically. In this Tier, the assignment is more open and complex; students are challenged to think critically and deeply about solving equations.

Observe students as they complete their Tiered Assignment. Provide feedback as required. See the Class Assessment Checklist (Appendix A).

**Pairs → Peer Assessment**

Students:
- Pair up with classmates in the same Tier to review each other's work, providing feedback as appropriate using Peer Assessment—Solving Linear Equations (Appendix D)
- Refine their work based on teacher and peer feedback

**CONSOLIDATION AND CONNECTION**
- Helping students demonstrate what they have learned
- Providing opportunities for consolidation and reflection

**Heterogeneous Groups of Three to Four → Puzzle**

Cut out the cards on the Linear Equations Puzzle (Appendix E) that contain full solutions to four different equations, and place a set of cut-outs in a bag or envelope. Create new heterogeneous groups of three or four students composed of members from each of the three Tiers and give each group a set of cut-outs. Group members work together to sort the pieces and construct the four full solutions.

Circulate while students complete the group puzzle to observe their level of understanding of solving linear equations. See the Class Assessment Checklist (Appendix A).

**Individuals → Self-Assessment**

Students complete the “After” column of the Self-Assessment (Appendix B).

Use assessment information to determine the starting point for subsequent work on linear equations.